

Sandia National Laboratories Primary Hazard Screening (PHS)

PHS Number: SNL06A00448-005

CINT (clean room, all labs) - Integration Lab

I. Signatures (Electronic signature dates shown)

Risk Management Determination

Hazard Classification: **Low**Required Documentation: **PHS with integral HA**Facility/Project Designator: **Non-nuclear Facility**Date Created: **07/06/2009**DOE Order References: **425.1C**Results as of: **10/01/2009**Activity-level PHS: **N**

Author / Technical Review:

I am knowledgeable of the activities and hazards covered by this PHS and, after doing due diligence, the description, notes, identified hazards, analyses, and other information contained in this PHS are complete and accurate.

Author : **NOGAN,JOHN**Org: **01132** **09/23/2009 18:23:47**

The description and notes describe and scope the activities performed under this PHS. All hazards have been identified. Questions are answered correctly and, as necessary, rationale or clarification is provided. All hazards in the HA have been analyzed, including the identification of controls for each hazard. I have performed the above reviews and concur that those items are complete and accurate.

ES&H Coordinator : **STARR,MICHAEL**Org: **01131** **CONCUR - 09/24/2009**

Quality Review:

This PHS meets minimum Corporate standards for 1) description/notes and 2) required information. There are no gross inconsistencies. I have performed the above reviews and concur that those items are complete and accurate.

PHS Team : **HALL,CHRISTOPHER ARMANDO**Org: **04126** **CONCUR - 09/28/2009**

Approver:

The description and notes describe and scope the activities performed under this PHS. All hazards have been identified. Questions are answered correctly and, as necessary, rationale or clarification is provided. All hazards in the HA have been analyzed, including the identification of controls for each hazard. I have reviewed this PHS and concur that its contents are accurate and complete. I will ensure that the requirements and commitments in this PHS are implemented prior to the start of work.

Approving Manager : **HEARNE,SEAN J.**

Org: **01132**

APPROVE - **10/01/2009**

II. PHS Purpose, Limitations, and Use in Work Planning and Control

Purpose of the PHS

For the scope of work identified, the PHS identifies:

- High-level (primary) hazards (e.g. chemicals, toxic gasses, explosives)
- Some, but not all controls (e.g. PPE, respirators, ventilation, lockout/tagout, and NEPA), please see the limitations section, below for additional information.
- A Hazard Classification, which determines the requirements for additional Safety Basis documents [e.g., Hazard Analysis (HA), Safety Assessment (SA), Safety Assessment Document (SAD), Documented Safety Analysis (DSA) etc.]
- For the hazards and controls identified, the PHS enables the identification and communication of:
 - Requirements documents (such as ES&H Manual chapters, sections, and supplements) that must be reviewed to determine specific requirements applicable to the work
 - ES&H Manual-required training
 - Action and Warning messages that highlight key requirements.

The Hazard Analysis section of the PHS is used to perform a high-level hazards analysis and controls selection for hazards with a Hazard Classification of 'Low' and, optionally, for Standard Industrial Hazards (SIH).

Limitations of the PHS for Use in Activity-level Work Planning and Control

Unless additional information is specifically added, a PHS **does not** contain all of the detail necessary to identify and control hazards at the activity/task level. The reasons for this include:

- PHSs are typically written at the project or work-area level and therefore, do not contain sufficient detail about individual tasks or the hazards/controls associated with them.
- While the PHS provides requirements for the hazards and controls identified, it **does not** provide a comprehensive list of all requirements in the ES&H Manual and related documents. Furthermore, many of the requirements are identified by reference to sections of the ES&H Manual, which must be evaluated for requirements applicable to the specific work being performed.
- It is impractical to ask enough questions to generate the level of detail necessary for activity/task-level hazard identification and control; human analysis must be employed. Consequently, details must be developed by a work planner, including:
 - Specific details about the hazard (e.g. what chemical, which laser, when, under what conditions, and where)
 - Other controls needed, since the only controls automatically identified are the ones with ES&H Manual requirements that result from their use. Important controls, such as access control, interlocks, shielding, monitoring, and personnel qualifications are not identified.
 - Specificity about controls (e.g. type of PPE, ventilation specifications)
 - Details on how and when you implement each control
 - Information on who needs to take what training

Recommended Use of the PHS to Support Activity-Level Work Planning & Control

The information developed in the PHS and any resultant Safety Basis documents should be utilized when performing the subsequent task of activity-level hazard identification, analysis, and control selection, where (1) the major work steps are identified; (2) the hazards associated with each major step are identified and analyzed; and (3) the controls for each hazard are identified and verified to be adequate to protect the involved workers. For the vast majority of work performed at Sandia, the Job Safety Analysis form (SF 2001-JSA) or equivalent is the recommended tool to use for this purpose. The JSA provides a systematic process for a team of involved workers and SMEs to ensure the activity-level work scope is rigorously analyzed to identify all potential hazards and specify appropriate controls for each hazard. Information from the PHS and Safety Basis documents is used as an input in developing the JSA, and the results of the JSA are used to develop TWDs, procedures, or other work instructions as appropriate.

In some cases, the PHS system may be used for activity level hazard identification, analysis, and controls identification, however, the PHS usually must be supplemented with additional information to provide the level of detail necessary to serve this purpose. In these cases, a PHS should be designated as an "Activity-Level PHS" on the PHS General Information page; however, these PHSs will be reviewed during the review and approval process to confirm that they contain the detail necessary to identify the hazards and controls at any stage of the work being performed. If determined to not be adequate, options include (1) revising the PHS to include adequate information; or (2) removing the "Activity-Level PHS" designation, and using a JSA/JSA-equivalent process to perform activity-level hazard identification, analysis, and control selection.

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IV. General Information

Document Status

Question Set Version: I

Status: **APPROVED**

Expiration Date: **10/01/2010**

Responsible Organization: **01132**

Radiological Protection Level for this facility or project: **Normal**

Description

The integration wing of the CINT Core facility is a clean room where the bays are class 1000 and the chases, gowning room (1508), and parts clean room (1511) are class 10,000. The operations in the clean room are focused on micro- and nano-fabrication of devices for the study and development of nano-technology. These processes include, but are not limited to, wet and dry etching of Si and GaAs, deposition of metal, insulators and semiconductors, contact mask photo-lithography, electro-beam lithography, and focus ion beam machining. These processes will require the use of both gaseous and liquid hazardous chemicals that are typically used in microfabrication.

Room 1504: The Focused Ion Beam area (Room 1504 and adjoining Equipment Chase) of the CINT Integration Laboratory specifically includes normal operations and maintenance for the focused ion beam tool / secondary electron microscope tool. The primary function of the tool is to micro-machine Si micro-fabricated parts into unique geometries using a 10 nanometer wide stream of ionized gallium in a vacuum chamber. The chamber is exhausted to the centralized house exhaust system. In addition, this room contains a Heidelberg Instruments Inc. DWL 66-fs Lithography Mask laser writer, which contains a class 3B HeCd laser, 120 mW @ 442 nm that is interlocked to be inherently safe during normal operation.

Room 1506 is the central storage area for general laboratory supplies and serves as a pass through for the transfer of processing chemicals into the cleanroom. No lab work done in this area.

Room 1507 is the pregowning room where the activities are restricted to the initial gowning and there will be no lab work done in this area.

Room 1508 is the gowning room where the activities are restricted to the final gowning and there will be no lab work done in this area.

Room 1511 is the parts clean and assembly area. The wet processing bench in 1511 supports etching of Si using TMAH or KOH solutions, and supports general base etch and cleaning processes. The solvent bench provides a ventilated workspace for removing photoresist or for general surface cleaning and degreasing. Two high speed diamond saws and a scribe and

break tool support back end of line (BEOL) dicing of Si, ceramic and glass substrates. The lapping tool allows materials such as glass and silicon to be thinned and or polished.

Room 1515 is the main equipment pass through for the cleanroom. Equipment entering the cleanroom is wiped down in this area in preparation for entry. Equipment leaving the cleanroom also pass through this area. Heat transfer fluids, pump oils and other flammable materials in support of cleanroom operations are stored in the flammable storage cabinet. No lab work is done in this area.

Room 1517 is the house keeping room, where the sink and supplies for cleaning of the Integration Lab are stored. No lab work done in this area.

Room 1516 is the chemical and integration lab storage room, which is used to store silicon substrates, temperature sensitive polymers and solvents that require refrigeration, non-precious deposition metals and targets, and diagnostic equipment. Chemicals and materials are segregated and stored in properly designated locations. No lab work done in this area.

Rooms 1522 and 1523: Designated as the chase and lithography room, respectively. Chase 1522 function is to provide space for the storage of personal protective equipment (chemical aprons and face shields) and provide service access to back of the 1523 processing equipment. No laboratory experiments will be performed in this area. Room 1523 will be used for the process and associated metrology of contact mask lithography. This includes processing of industry standard photoresist, which typically requires spinning the photoresist on a wafer followed by exposing using a NUV 365-400 nm or DUV 265nm contact mask aligner, or ebeam writer and baking at up to 400C on a hot plate or up to 200C in an oven. After pattern exposure and soft bake, the photoresist is then developed at the base bench using a dilute TMAH or KOH solution. An O₂ barrel ash reactor and UV ozone cleaner are used for the purpose of cleaning light organic materials from a substrates surface following the develop operation. Solvents are used at the solvent bench for the purpose of degreasing a surface or for the removal of photoresist. Metrology equipment includes an optical microscope for visual inspection.

Room 1525: This bay contains multiple vacuum deposition systems (base pressure 10^{-7} torr) which include PVD by electron beam and PVD by sputter or reactive sputter. The ebeam allows for the deposition of high purity material typically used in lift-off and subtractive etching processes. The sputtering system provides a means to deposit conformal metal, semimetal of insulating (dielectric) thin films typically for subtractive etch processes. A profilometer located in the bay provides a method for the measurement of post PVD deposition film thickness.

The chemical benches will be used for standard processing of devices fabricated on Si wafers. Typical processes will include metal lift-off by the removal of photoresist and degreasing using solvents, acid and base wet chemical etching of metals, Si, and SiO₂ and other common processes. The rapid thermal anneal (RTA) uses a set of lamps to rapidly heat silicon wafers to temperatures in excess of 1000C in an inert environment, such as Argon. Additionally, forming gas (3% H₂ in nitrogen) can be used in the RTA to prevent oxide formation during annealing.

Room 1527: Bay 1527 has two inductively coupled plasma (ICP) etch reactors and a plasma enhanced chemical vapor deposition (PECVD) reactor. The PECVD reactor allows the conformal deposition of hydrogenated amorphous poly-Si, silicon nitride, and silicon oxides. The ICP etch reactors are used for dry etching of materials such as aluminum, titanium, tungsten, carbon, oxides, nitrides, polysilicon, among other materials. This bay also contains a combination electron beam/thermal evaporation deposition system (base pressure 10^{-7} torr) for high quality metal depositions. A discrete wavelength ellipsometer and a spectroscopic reflectometer also located in the bay provide a means for dielectric thin film measurement. Additionally, a scanning laser 3a tool, called a Flexus, is located in 1527 and used to measure wafer curvature. The system is interlocked for safety purposes.

Chase #1528: The toxic gasses are self-contained within built-in toxic gas cabinets in each tool supporting room #1527. Silane (100%) is contained in a fully automatic gas cabinet that is located next to the PECVD reactor pumps. There are toxic gas monitoring sensors located in each of the gas cabinets and in the vicinity of the tools to detect leaks and shut down the gas at the cylinder in the event of a leak.

Room 1530: Bay 1530 contains a Inductively Coupled Plasma Silicon Deep Reactive Ion Etch system (ICP SiDRIE) for the purpose of high aspect ratio Si etching, a fluorine reactive ion etch (F-RIE) for the purpose of etching some metals, organics and various dielectrics, and a Down Stream Microwave (DSMW) ash system for surface cleaning and to strip organic polymers such as photoresist. A discrete wavelength ellipsometer allows for refractive index and dielectric thin film measurement and a profilometer provides a contact method for measuring step height and surface roughness. A critical point dryer located in the bay allows delicate structures and membranes to be dried without risking damage to the device.

Chase #1531: The Non-toxic gasses are stored in chase #1531 and plumbed into bays throughout the cleanroom, the chase environment is monitored for oxygen deficiency.

The Toxic Gas Monitoring System (TGMS) system is comprised of a decentralized Life Safety Network based on the LonWorks Technology with intelligent network nodes. The digitally networked input/output devices will notify personnel and shut down equipment based on a program customized for the requirements of the CINT Integration Labs. Network devices include Honeywell (MST Technology) Satellite FTT gas monitors, Echelon digital interface modules, bus monitors, a Local Information Display and DVS (Data Visualization System). Output devices include beacons/horns, relay shut down of gases and signals to the Sandia Fire Protection panel for notification to the Sandia Emergency Operation Center.

Chemical hazards have been evaluated in the following ESHERs. No concerns were identified.

ER2007-2552 - Lab 1504

ER2007-2559 - Lab 1501

ER2007-2646 - Lab 1522

ER2007-2630 - Lab 1525

Notes from Document or Interview

General Document Notes

9/28/09 - Mike Starr entry:

The environmental hazard table notes "Sterilized Bio Wastes" which is incorrect. There isn't any biological work performed in the integration lab. This entry will be deleted during the next review.

Locations

Primary Location

Site : **SSTP**

Area : **No Tech Area**

Bldg : **518**

Room : **1501**

Other Locations

Site	Area	Building	Room	Description
SSTP	No Tech Area	518	1504	
SSTP	No Tech Area	518	1511	
SSTP	No Tech Area	518	1512	
SSTP	No Tech Area	518	1513	Room 1513
SSTP	No Tech Area	518	1519	
SSTP	No Tech Area	518	1522	
SSTP	No Tech Area	518	1523	
SSTP	No Tech Area	518	1524	
SSTP	No Tech Area	518	1525	
SSTP	No Tech Area	518	1526	
SSTP	No Tech Area	518	1527	
SSTP	No Tech Area	518	1528	
SSTP	No Tech Area	518	1530	
SSTP	No Tech Area	518	1531	
SSTP	No Tech Area	518	1532	
SSTP	No Tech Area	518	1533	

Responsible Organization History

Organization Number	Effective (Starting) Date	This Org. Submitted Document for Review
01132	06/11/2004	Y

V. Identified Hazards

Hazard Name	Hazard Description	Source (Question or Table)
traffic related hazards	traffic related hazards for injury	Required by general corporate business process
common electrical hazards	common electrical hazards	Required by general corporate business process
RGD below LOW hazard classification requirements.	potential for minor injury or illness	QUESTION 1
Certified cabinet X-ray device	potential for minor injury or illness	QUESTION 1b(1)
Lasers	Potential eye and skin hazards	QUESTION 4
Use or storage of chemicals	Potential personnel exposure to chemicals & fire protection regulatory requirements	QUESTION 5
Unevaluated chemical use	potential chemical overexposure	QUESTION 5a
Unbound Engineered Nanoscale Particles (UNP)	Unbound Engineered Nanoscale Particles(UNP); Potential inhalation and dermal exposure to UNP.	QUESTION 5c
Standard industrial levels of chemicals	Corrosive chemical; Potential exposure to skin and eyes.	QUESTION 5e
Exposure to hydrofluoric acid	Potential exposure to skin and eyes	QUESTION 5f
Noncompliant storage, dispensing, or use of flammable/combustible liquids could cause fire/explosion.	fire/explosion hazard	QUESTION 5h
Chemical physical hazards	hazards from fires, reactions, and explosions	QUESTION 5i
Toxic gasses	Potential exposure to toxic gasses in the event of a release	QUESTION 5k(1)
Exposed and energized electrical circuits	potential electrical shock or arc	QUESTION 6a
Standard industrial mechanical hazards	potential injury from mechanical forces	QUESTION 7
Portable power tools	potential injury from portable power tools	QUESTION 7b
Unevaluated nonionizing radiation	Potential exposure to nonionizing radiation.	QUESTION 8a
Standard industrial thermal hazard(s)	Contact with hot or cold objects	QUESTION 9a
Standard industrial pressure hazard(s)	Injury or damage	QUESTION 10
Environmental concern below LOW hazard classification requirements.	potential for regulatory action	QUESTION 15
Wastewater discharge, SIH hazard	potential to exceed permitted amounts	QUESTION 15a
General Wastewater discharge, SIH hazard	potential to exceed permitted amounts	QUESTION 15a(1)

Hazard Name	Hazard Description	Source (Question or Table)
Air discharge, SIH hazard	potential to emit regulated contaminants	QUESTION 15b
Regulated chemicals	potential to emit regulated contaminants	QUESTION 15b(3)
Hazardous Wastes	potential for regulatory action	QUESTION 15d
Exposure to hazardous energy	potential injury to personnel from exposure to hazardous energy	QUESTION C3

VI. Required Actions

Off-Site Requirements:

NONE

Warning Messages:

1. Radiological safety training shall include procedures specific to an individual's job assignment. See CPR 400.1.1.32/MN471016, Radiological Protection Procedures Manual, Chapter 3, "Radiological Training Program," topic 4.3.2, for requirements and guidance. **Comment added: Personnel have completed RAD102 for RGD operations.** (QUESTION 1)
2. There are a variety of requirements applicable to chemicals. Refer to the portions of MN471001 ES&H Manual relevant to the activities being performed for requirements. **Comment added: Requirements set forth in MN471001 ES&H Manual have been implemented for activities involving chemicals.** (QUESTION 5)
3. 10 Code of Federal Regulations Part 851, Worker Safety and Health Program, as implemented through various Sandia requirement documents (e.g., MN471001 ES&H Manual, PG470246, 10 CFR 851 Worker Safety and Health Program Plan), requires an exposure assessment of chemical hazards to ensure hazards have been identified and prevented or abated. **Comment added: IH will be contacted to perform an exposure assessment of chemical hazards.** (QUESTION 5a)
4. Flammable and combustible liquids must be bonded in accordance with the requirements in: The Sandia, "Log of Consultation." **Comment added: Flammable and combustible liquids are bonded in accordance with the requirements.** (QUESTION 5g)
5. Any activity inside the Limited Approach Boundary is considered working near energized parts and requires a senior-manager-approved technical work document (TWD). **Comment added: Only qualified personnel perform work on electrical equipment/systems.** (QUESTION 6a)
6. 10 Code of Federal Regulations Part 851, Worker Safety and Health Program, as implemented through various Sandia requirement documents (e.g., MN471001 ES&H Manual, PG470246, 10 CFR 851, Worker Safety and Health Program Plan), requires an exposure assessment of workplace hazards to ensure hazards have been identified and prevented or abated. **Comment added: An exposure assessment of workplace hazards will be conducted to ensure hazards have been identified and prevented or abated.** (QUESTION 8a)
7. All operators of the system must be qualified according to the requirements of the Pressure Safety Manual. The Pressure Operator Qualification Form (SF 2001-PQF) is available as an optional tool for documenting the applicable training and qualification requirements for pressure applications. See MN471000, Pressure Safety Manual, Chapter 2, "The Pressure Safety Program," for requirements and guidance on qualification of pressure operators. **Comment added: Operators have completed PRS150 Pressure training for operations involving pressure applications.** (QUESTION 10a)
8. All installers of the system must be qualified according to the requirements of the Pressure Safety Manual. The Pressure Operator Qualification Form (SF 2001-PIQ) is available as an optional tool for documenting the applicable training and qualification requirements for pressure applications. See MN471000, Pressure Safety Manual, Chapter 2, "The Pressure Safety Program," for requirements and guidance on qualification of pressure installers. **Comment added: Installers have completed PRS250 training for the pressure applications in the integration laboratory.** (QUESTION 10b)
9. All operators who work with cryogenics must be qualified according to the requirements of the Pressure Safety Manual. The Pressure Operator Qualification Form (SF 2001-PQF) is available as an optional tool for documenting the applicable training and qualification requirements for cryogen applications. See MN471000, Pressure Safety Manual, Chapter 2, "The Pressure Safety Program," for requirements and guidance on qualification of cryogen system operators. **Comment added: Personnel using cryogenics have completed the PRS115, Cryogen Safety training.** (QUESTION 10c)
10. There may also be requirements for waste minimization and documentation of waste minimization efforts/results. Contact the Pollution Prevention Team for assistance with waste minimization. **Comment added: EP works with CINT personnel on waste minimization efforts.** (QUESTION 15d)
11. All contractors performing servicing and maintenance on SNL-owned equipment shall perform LOTO when required in accordance with 29 CFR 1910.147 (OSHA Standards for General Industry) and comply with the following two additional requirements: (1) The contractor shall be briefed on SNL-specific LOTO devices and

procedures applicable to the equipment under maintenance. (2) The contractor shall inform the SNL equipment owner and other authorized or affected workers of the contractor's energy control procedure/process, including any differences between that process and SNL-specific requirements. **Comment added: All contractors performing servicing and maintenance on SNL-owned equipment perform LOTO when required.**

(QUESTION C3a(1)a)

12. Equipment specific procedures are required for servicing and maintenance according to the requirements of MN471001, ES&H Manual, Section 4C. **Comment added: Equipment specific procedures are in place for servicing and maintenance according to the requirements of MN471001, ES&H Manual, Section 4C.**

(QUESTION C3a(1)b)

Action Messages:

1. Contact your Division ES&H Team for a survey. **Comment added: All RGDs are inherently safe and have been surveyed.** (QUESTION 1a)

2. Write a Technical Work Document (TWD). See CPR400.1.1.32/MN471016, "Radiological Protection Procedures Manual," Chapter 1, "Radiological Work Planning and Controls," and Chapter 10, "Radiation Generating Devices" for requirements and guidance. **Comment added: A TWD is not required for inherently safe RGDs.** (QUESTION 1b(1))

3. Implement actions and control measures specified in the applicable Industrial Hygiene exposure assessment. **Comment added: IH will be contacted to perform an exposure assessment and actions/control measures specified will be implemented.** (QUESTION 4a)

4. Contact the Industrial Hygienist on the appropriate Division ES&H Team to evaluate exposure to chemicals and determine control measures, prior to working with chemicals. **Comment added: IH will be contacted to evaluate exposure to chemicals and determine control measures.** (QUESTION 5a)

5. Where eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for emergency quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use. See MN471001, ES&H Manual, Section 6M, "Safety Showers and Eyewashes," for requirements and guidance. **Comment added: Emergency eyewash/showers exist throughout the integration lab and are tested on a regular basis.** (QUESTION 5e)

6. Contact Site Fire Marshal for an Operational Permit. See the ES&H Direct Access Services List. **Comment added: The Site Fire Marshal will be contacted for an Operational Permit.** (QUESTION 5g)

7. Refer to "Log of Consultation," with a subject of, "Storage, Dispensing, Bonding, and Grounding of Flammable and Combustible Liquids." Contact Fire Protection Engineering for assistance. See the ES&H Direct Access Services List. **Comment added: The log of consultation will be reviewed for additional information.** (QUESTION 5h)

8. Work on energized electrical circuits is restricted to certain individuals. Ensure only qualified personnel perform work on electrical equipment/systems at SNL. It is the responsibility of the department manager to determine an employee's electrical qualifications. To become qualified to perform electrical work a person shall do the following:

Demonstrate a familiarity, through interview, demonstrated experience (i.e., resume/review) or direct observation, with the hazards of the workplace and the specific equipment to be worked on, as well as any associated ES&H Standard Operating Procedures (SOPs) and Operating Procedures (OPs).

Demonstrate a familiarity, through interview, demonstrated experience (i.e., resume/reference) or direct observation, with electrical maintenance techniques, codes, and other general electrical knowledge.

Have qualifications reviewed and approved by their department manager to ensure they are qualified for a particular job assignment.

NOTE: A person qualified to work with certain equipment may be considered "unqualified" to work on similar equipment without first being advised of any differing hazards involved. **Comment added: Only qualified personnel perform work on electrical equipment/systems.** (QUESTION 6a)

9. Use a technical work document (TWD) to perform energized work as follows: If the energized work is diagnostic (such as troubleshooting, measuring voltage, etc.), an OP is required. You can find an example of a completed energized electrical OP on the Electrical Safety homepage. This could easily be used as a template for any R&D electrical activity. If the work involves manipulation or reconfiguration of an energized component, an Energized Work Permit (EWP) must be completed. A EWP is needed each time such tasks are to be completed. An EWP may be obtained from the SNL internal web under Corporate Forms EWP-SF2005-EWP (10-2005). **Comment added: A TWD is used to perform energized work.** (QUESTION 6a)

10. The energized work decision tool shall be used to determine PPE and hazard analysis requirements. Prior to PPE use, workers shall receive site-specific PPE training. See MN471001, ES&H Manual, Section 4L, "Personal Protective Equipment (PPE)" for requirements and guidance regarding site-specific PPE training. See MN471004, Electrical Safety Manual, Chapter 2 "General Requirements," "2.10 Personal Protective Equipment," for requirements and guidance. **Comment added: Appropriate PPE and HA requirements are identified prior to any work.** (QUESTION 6a)

11. Contact the Industrial Hygienist on the appropriate Division ES&H Team prior to using nonionizing radiation sources, to evaluate exposure to nonionizing radiation and determine control measures. **Comment added: Nonionizing radiation sources will be evaluated to determine control measures.** (QUESTION 8a)

12. In California, Contact the Air SME if any of the chemicals being used are listed on the Toxic Air Contaminants Table. **Comment added: The integration laboratory is located at SNL/NM. Therefore, the California Air SME does not need to be contacted.** (QUESTION 15b(3))

13. As required by the ES&H Manual, Section 19A, "Hazardous Waste Management," Members of the Workforce who are owners or generators of hazardous waste **shall plan** how to control hazards and appropriately manage their hazardous waste. **Comment added: Personnel adhere to the requirements in the ES&H Manual, Section 19A, "Hazardous Waste Management".** (QUESTION 15d)

Required Training

[Note: This training is a regulatory requirement for one or more people involved in operations associated with identified hazards. Each class may not be required by all people working in the area.] Please note that some training classes are only provided occasionally. Please be sure to allow adequate lead-time for personnel to schedule and complete training.]

Course Code	Course Title	Exclusions	Training Interval (Years)	One-time Training
ELC106	R&D ELECTRIC AL SAFETY (> 50 VOLTS)	ELC106, unless not required by the energized work decision tool	--	Yes
ELC106R	R&D ELECTRIC AL SAFETY REFRESHE R (> 50 VOLTS)	unless not required by the energized work design tool.	3	No
ENV112	HAZARDO US WASTE & ENVIRONM ENTAL MANAGEM ENT TRAINING	(all locations other than SNL/CA will take ENV112)	1	No
ESH100	ES&H AWARENE SS		1	No
ESH200	SAFETY MANAGEM ENT		--	Yes

Course Code	Course Title	Exclusions	Training Interval (Years)	One-time Training
HAZ101	EMPLOYEE BASIC HAZCOM	LAB100 is acceptable for emergency response activities, if already completed	2	No
HAZ103	SITE-SPECIFIC HAZCOM		2	No
LAB100	LABORATORY STANDARD INFORMATION AND TRAINING	LAB100 (HAZ101 is acceptable if already taken)	2	No
LAB103	SITE-SPECIFIC LABORATORY SAFETY TRAINING		2	No
LAS200SPEC	SITE SPECIFIC TRAINING FOR CLASS 3B & 4 LASER USERS		3	No
LAS202	FUNDAMENTALS OF LASER SAFETY		3	No
LTO210	LOCKOUT/TAGOUT FOR AUTHORIZED WORKERS		3	No
LTO220	ANNUAL LOCKOUT/TAGOUT (LOTO) ROLES & RESPONSIBILITIES FOR AUTHORIZED WORKERS		1	No

Course Code	Course Title	Exclusions	Training Interval (Years)	One-time Training
MED105HF	HYDROFLUORIC ACID SAFETY		3	No
NANO101	NANOTECHNOLOGY SAFETY AWARENESS TRAINING		3	No
PRS115	CRYOGEN SAFETY	for all operators of the system who work with cryogenics	3	No
PRS150	PRESSURE SAFETY ORIENTATION	for all operators of the system for all installers of the system	--	Yes
PRS150R	PRESSURE SAFETY ORIENTATION REFRESHER		3	No
PRS250	ADVANCED PRESSURE SAFETY	for all installers of the system	--	Yes
PRS250R	ADVANCED PRESSURE SAFETY REFRESHER		3	No
RAD102	GENERAL EMPLOYEE RADIOLOGICAL TRAINING	RAD102 unless RAD210, RAD214 (recommended), RAD230, or SNL qualified RCT training.	2	No
RAD219	RADIATION - GENERATING DEVICE CUSTODIAN TRAINING	for both primary alternate custodians	1	No
RAD250	MANAGEMENT OF RADIOLOGICAL OPERATIONS		2	No

Regulatory Requirements

Regulatory and Standards Drivers for this Facility or Lab:

[Note: ES and H Manual sections listed below contain requirements and guidance that pertain to the hazards you have identified in this PHS. It is your responsibility to ensure these requirements have been fulfilled.]

1. (QUESTION 1) CPR400.1.1/MN471001 - ES&H Manual, Section 13C, "Authorization Basis Documentation Process" for SIH, Low, Moderate, and High; unknown hazard potential since item(s) have not gone through the standards, testing rigor and hazard analysis associated with
2. (QUESTION 1) CPR400.1.1.32/MN471016 - Radiological Protection Procedures Manual, Chapter 3, "Radiological Training Program"
3. (QUESTION 1) CPR400.1.1.32/MN471016, Radiological Protection Procedures Manual, Chapter 10, "Radiation Generating Devices"
4. (QUESTION 1b(1)) CPR400.1.1.32/MN471016, Radiological Protection Procedures Manual, Chapter 10, "Radiation Generating Devices"
5. (QUESTION 1b(1)) CPR400.1.1.32/MN471016, Radiological Protection Procedures Manual, Chapter 1, "Radiological Work Planning and Controls."
6. (QUESTION 4) MN471001 - ES&H Manual, Section 6G, "Lasers and Intense Light"
7. (QUESTION 4a) MN471001 - ES&H Manual, Section 6G, "Lasers and Intense Light"
8. (QUESTION 5) MN471001, ES&H Manual, Section 6D, "Hazard Communication Standard," and Section 6E, "Laboratory Standard - Chemical Hygiene Plan"
9. (QUESTION 5) MN471001 - ES&H Manual, Section 6E, Laboratory Standard - Chemical Hygiene Plan
10. (QUESTION 5) MN471001, ES&H Manual, Section 6U, "Hazardous Material (Chemical and Biological) Inventory"
11. (QUESTION 5c) MN471001, ES&H Manual, Section 6Q, "Nanotechnology Safety" (RQ_MN471001_06Q)
12. (QUESTION 5e) MN471001 - ES&H Manual, Section 6M, "Safety Showers and Eyewashes"
13. (QUESTION 5f) MN471001 - ES&H Manual, Section 16, "Health, Benefits and Employee Services"
14. (QUESTION 5h) MN471001, ES&H Manual, Section 5A, "Fire Protection Requirements"
15. (QUESTION 6a) MN471001 - ES&H Manual, Section 4L, "Personal Protective Equipment (PPE)" for requirements and guidance regarding site-specific PPE training
16. (QUESTION 6a) MN471004 - Electrical Safety Manual, Chapter 2 "General Safety Requirements," 2.10 "Electrical Personal Protective Equipment," for requirements and guidance
17. (QUESTION 6a(2)) MN471004 - Electrical Safety Manual, Chapter 2 "General Safety Requirements," "2.2 Qualifications and Training"
18. (QUESTION 7a) MN471001 - ES&H Manual, Section 4N, "Industrial Machine and Portable Power Tool Safety"
19. (QUESTION 7b) MN471001 - ES&H Manual, Section 4N, "Industrial Machine and Portable Power Tool Safety"
20. (QUESTION 8) MN471001 - ES&H Manual, Section 6J, "NonIonizing Radiation"
21. (QUESTION 8a) MN471001 - ES&H Manual, Section 6J, "NonIonizing Radiation"
22. (QUESTION 10a) MN471000 - Pressure Safety Manual, Chapter 2, "The Pressure Safety Program"
23. (QUESTION 10b) MN471000 - Pressure Safety Manual, Chapter 2, "The Pressure Safety Program"
24. (QUESTION 10c) MN471000 - Pressure Safety Manual, Chapter 2, "The Pressure Safety Program"
25. (QUESTION 10d) MN471000 - Pressure Safety Manual, Chapter 9, "Documenting the Operational Safety of Pressure Systems"
26. (QUESTION 10e) MN471000 - Pressure Safety Manual, Chapter 9, "Documenting the Operational Safety of Pressure Systems"
27. (QUESTION 10f) MN471000 - Pressure Safety Manual, Chapter 6, "Testing and Evaluating Pressure Systems"

- 28. (QUESTION 10f) MN471000 - Pressure Safety Manual, Chapter 7, "Verifying the Safe Operation of Pressure Systems"
- 29. (QUESTION 10f) MN471000 - Pressure Safety Manual, Chapter 8, "Servicing Pressure Vessels and Components"
- 30. (QUESTION 15a) MN471001 - ES&H Manual, Section 10H, "Discharges to the Sanitary Sewer System"
- 31. (QUESTION 15a(1)) MN471001 - ES&H Manual, Section 10H, "Discharges to the Sanitary Sewer System"
- 32. (QUESTION 15b) MN471001 - ES&H Manual, Chapter 17, "Air Emissions"
- 33. (QUESTION 15b(3)) MN471001 - ES&H Manual, Chapter 17, "Air Emissions"
- 34. (QUESTION 15d) MN471001 - ES&H Manual, Section 19A, "Hazardous Waste Management" (all locations other than SNL/CA)
- 35. (QUESTION 15d) MN471001, ES&H Manual, Chapter 20, "Waste Management at SNL/CA" (SNL/CA only)
- 36. (QUESTION C1) MN471001 - ES&H Manual, Section 6P, "Local Exhaust Ventilation (LEV)"
- 37. (QUESTION C2) MN471001, ES&H Manual, Section 4L, "Personal Protective Equipment (PPE)," "General Requirements for Personal Protective Equipment (PPE)"
- 38. (QUESTION C2a(1)) MN471001, ES&H Manual, Section 4L, "Personal Protective Equipment (PPE)," "General Requirements for Personal Protective Equipment (PPE)"
- 39. (QUESTION C3a(1)a) MN471001 - ES&H Manual, Section 4C, "Lockout/Tagout and Administrative Control Locking", also see information at loto.sandia.gov
- 40. (QUESTION C3a(1)b) MN471001 - ES&H Manual, Section 4C, "Lockout/Tagout and Administrative Control Locking", also see information at loto.sandia.gov
- 41. (QUESTION C4) MN471001 - ES&H Manual, Section 10B, "National Environmental Policy Act (NEPA), Cultural Resources, and Historic Properties"
- 42. (Required by general corporate business process) MN471001 - ES&H Manual, Section 4B, "Electrical Safety Practices"
- 43. (Required by general corporate business process) MN471001 - ES&H Manual, Section 4K, "Traffic Safety"
- 44. (Required by general corporate business process) MN471001, ES&H Manual, Section 21, "Technical Work Documents (TWDs)"

VII. Related Documents

NEPA Documents	Number	Project End Date
CINT Integration Laboratories (1501, 1504, 1523, 1525, and 1527)	SNA07-0202	
CINT room 1511 - Integration Lab Parts Clean room	SNA08-0179	

Other Documents	Number	Type	Published Date
Environmental Assessment for CINT at SNL/NM	DOE/EA-1457	EA	03/01/2006
Operating Procedure for Toxic/Pyrophoric/Inert Gas Cylinders Change-Out	OP1100.189	OP	01/17/2008
Standard Operating Procedure for Working with Hazardous and Particularly Hazardous Chemicals in Center 1100 Laboratories	SOP1100.001 Issue D	SOP	07/23/2008

Permits	Number	Type	End Date
CINT's Authority-to-Construct Permit No. 1725 Actual Date of Initial Start-up	No. 1725	Air	10/11/2004
City of Albuquerque - Wastewater Discharge Permit for CINT	2238A	Water	01/04/2007

VIII. Primary Hazard Screening Worksheets

Version of Questions:I

Operation Type:Facility or Lab

Interview Worksheet:

	Questions	Answers
1	Radiation-Generating Devices (RGDs): Is there a radiation-generating device (RGD)? (Answer this question "no" if the RGDs are registered in storage.)	Yes
1a	Unless exempt, is the RGD <i>registered</i> with the Device Control Program?	Yes
1b	Are there any of the following radiation- generating devices (RGDs) / operations? Place a check mark to the right of all that apply.	
1b(1)	Certified cabinet	Yes
1b(2)	X-ray Diffraction or fluorescence analysis equipment	No
1b(3)	Other exempt-shielded RGD	No
1b(4)	X-ray generator or particle accelerator (Do your activities include an Accelerator as defined in the Help Text; Please read the help text, since this question has significantly changed.)	No
1b(5)	Other shielded RGD	No
1b(6)	Portable or mobile radiography RGD not using a radioactive source	No
1b(7)	Fixed device with partial shielding	No
1b(8)	Portable analytical device with an open-beam configuration	No
1b(9)	Open Installation not in the preceding classes	No
1b(10)	Unattended Installations	No
1b(11)	Neutron Generator Operations	No
1c	Will anyone enter any of the following areas?	
1c(1)	Controlled Area (unescorted access to do radiological work)	No
1c(2)	Radiation Area	No
1c(3)	High Radiation Area	No
1c(4)	Very High Radiation Area	No
1d	Are routine exposures <i>above</i> 100 <i>mrem</i> per year likely?	No
1e	Could a member of the public be exposed by the operation? (This usually involves portable or mobile radiography operations).	No
1f	Will there be radiological work in a <i>foreign country</i> or territory?	No
1g	Will the activity involve an RGD owned or operated by a party other than Sandia or Sandia's subcontractors?	No
1h	Is there an RGD or a facility for an RGD acquired, built, or modified on or after January 1, 1996-excluding those RGDs classified as inherently safe or a certified cabinet?	No

Notes: All the RGDs utilized in the integration laboratory are classified as inherently safe.

	Questions	Answers
1i	Will radiation <i>monitoring</i> instruments be used in this activity by MOW other than qualified Radiological Control Technicians?	No
1j	Will scrap metal generated from the project or activity come from a radiological area?	No
2	Radioactive Materials: Is radioactive material present?	No
3	Explosives and Ammunition: Are any explosives or ammunition (including explosive waste) managed, handled, processed, used, or stored?	No
4	Lasers: Do the activities covered by this PHS involve Regulated Laser Activities?	Yes
4a	Has the Industrial Hygiene Program performed an exposure assessment of the Regulated Laser Activities covered by this PHS?	Yes
4b	Do the activities involve directing the beam of any class of visible laser (400 - 700 nanometer) or any Class 3B or Class 4 laser into navigable airspace or where the beam could affect personnel not associated with this activity?	No
5	Chemicals: (Review the Help text before answering this question.) Do the activities involve chemicals?	Yes
5a	Has the Industrial Hygiene Program performed an exposure assessment of all of the current activities involving chemicals covered by this PHS?	No
5b	Do any of the activities include? <ul style="list-style-type: none"> - Cleanup operations at hazardous waste sites (e.g., environmental restoration [ER] sites - Hazardous waste operations at treatment, storage, and disposal (TSD) facilities - Emergency response or post-emergency response 	No
5c	Will activities have, use, synthesize, or liberate unbound engineered nanoscale particles (UNP)?	Yes
5d	(Review the help text before answering this question.) Do the activities involve storage or utilization of simple asphyxiants?	Yes
5d(1)	In an accidental gas or cryogenic liquid asphyxiant release, could more than 560 cubic feet of asphyxiating gas be released into the work space?	No
5e	Are the hazardous chemicals, hazardous substances, or hazardous waste involved in these activities considered corrosive materials?	Yes
5f	Do these activities involve the use of hydrofluoric acid?	Yes
5g	Do chemicals used in the activities meet or exceed the Operational Permit Amounts for hazardous materials listed in the International Fire Code (IFC) and National Fire Protection Association (NFPA) Guidance? (Please see IFC 105.6.20 Table 25-1 in the Help file for SNL Fire Protection's implementation requirements.)	Yes
5h	Do the activities involve the storage, dispensing, or use of flammable or combustible liquids?	Yes
5i	Do activities involve any of the following? <ul style="list-style-type: none"> - Flammable chemicals in quantities greater than 5 liters of liquid, 1 kg of solid, or 500 cubic feet of gas (at STP) in any single container or manifolded series of containers - Equipment connected to a house system for flammable gases - Reactive chemicals in quantities greater than 1 liter of liquid, 100 g of solid, or 500 cubic feet of gas in any single container or manifolded series of containers - Oxidizers, other than nitric acid, in quantities greater than 5 liters of liquid, 1 kg of solid, or 500 cubic feet of gas in any single container or process - Pyrophoric chemicals in total quantities greater than 500g - Metal powders in quantities greater than 1 kg 	Yes

	Questions	Answers
5i(1)	Is a flammable gas used for purposes OTHER THAN comfort heating or non-process hot water (e.g., restroom use)?	No
5j	Do the activities include a process that involves highly hazardous chemicals at or above twenty-five percent of the Process Safety Management standard threshold quantities, or are there flammable liquids or gases involved in a process in a quantity of greater than 2,500 pounds?	No
5k	Do activities use or store toxic gases in quantities greater than the de minimus quantities listed in the Help file?	Yes
5k(1)	Do the activities use or store toxic gases in quantities equal to or greater than the threshold quantities listed in the Help file?	No
5l	(Refer to help file to determine if quantities have been exceeded.) Do the activities use or store hazardous chemicals in quantities equal to or greater than the Emergency Management screening threshold quantities?	No
6	Electrical: Do workers conduct any of the following tasks? <ul style="list-style-type: none"> - Work on or near (within the limited approach boundary - 3.5 feet) exposed and energized (greater than or equal to 50 volts) electrical circuits or contact energized electrical circuit parts with tools or test probes? - Operate circuit breakers or disconnect switches operating at or above 50 Volts and 5 mA or more? - Perform non electrical work, but might contact exposed and energized electrical circuits - <i>operating at 50 volts or greater</i> - with equipment or materials, such as ladders, cranes, paint roller extensions, or forklifts? - Use Equipment that operates at 50 Volts or more and is not listed by an OSHA approved Nationally Recognized Testing Laboratory (e.g., UL) and operating at over 50 Volts, including extension cords or power strips? 	Yes
6a	Do workers work on or near (within the limited approach boundary - 3.5 feet) exposed and (greater than or equal to 50 volts) energized electrical circuits or contact energized electrical circuit parts with tools or test probes?	Yes
6a(1)	Are circuit parts storing 10 Joules or more, associated with Marx generators or pulsed power circuits ?	No
6a(2)	Are circuit parts associated with facility type electrical distribution systems ?	No
6b	Do workers operate circuit breakers or disconnect switches operating at 50 Volts or more and 5 mA or more ?	No
6c	Do workers perform non electrical work , but might contact exposed and energized electrical circuits - operating at 50 volts or more - with equipment or materials, such as ladders, cranes, paint-roller extensions, or forklifts?	No
6d	Do workers use equipment that operates at 50 Volts or more and is not listed by an OSHA-approved Nationally Recognized Testing Laboratory (e.g., UL), including extension cords and power strips?	Yes
6d(1)	Have all of the non-NRTL-approved electrical equipment or appliances been approved and documented using the Sandia non-NRTL-evaluation process?	Yes

Notes: If is discovered as being non-NRTL equipment, the electrical equipment or appliances will be approved and documented using the Sandia Non-NRTL evaluation process.

	Questions	Answers
7	<p>Mechanical: Does the facility or activity involve any of the following hazards or activities?</p> <ul style="list-style-type: none"> - machine shop equipment - portable power tools - powder-actuated tools - centrifuge operations - forklifts - motorized hand trucks - cranes/hoists, miscellaneous lifting devices, - industrial robots or industrial robotic systems - operate light or heavy earth-moving equipment - excavations - trenches - floor or wall penetrations - stored or kinetic mechanical energy that could cause an injury during normal working conditions 	Yes
7a	Do workers operate machine shop equipment?	No
7b	Do workers operate portable power tools?	Yes
7c	Do workers operate powder-actuated tools (also known as explosive-actuated fastening tools)?	No
7d	Does this facility or project activity use centrifuges?	No
7e	Are forklifts used in any operations?	No
7f	Are motorized hand trucks used in any operations?	No
7g	Are overhead cranes/hoists, mobile cranes, miscellaneous lifting devices (shop or gantry crane), or rigging used in any operations?	No
7h	Are industrial robots or industrial robotic systems used in this project or activity?	No
7i	Do workers operate light or heavy earth-moving equipment?	No
7j	Do workers perform or come into close proximity to any of these activities:	No
	<ul style="list-style-type: none"> - Excavations - Trenches - Floor or Wall Penetrations 	
7k	Do activities involve stored or kinetic mechanical energy that could cause an injury under normal working conditions?	No
8	Nonionizing Radiation: At any time, do activities produce nonionizing radiation (NIR) (excluding lasers)?	Yes
8a	Has the Industrial Hygiene Program performed an exposure assessment of the sources of nonionizing radiation covered by this PHS in their current configuration?	No
9	Thermal: Do thermal hazards or thermal stressors exist in the work area?	Yes

Thermal Hazards	
Source Name	Temperature
Heating equipment	500 F Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A Comments: Heating equipment such as soldering irons, heat guns, etc. will be used.
Liquid Nitrogen and Argon	77 K Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A
ovens	1000 C Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A Comments: Laboratory ovens and furnaces will be used.

Questions

Answers

- 9a Do thermal hazards exist in the work area in such a manner that Members of the Workforce may be exposed under normal conditions or in a foreseeable emergency? Yes
- 9b Do thermal stressors exist in the work area? No
- 10 **Pressure:** Are workers involved in the design, installation, operation, or maintenance of a pressure system (including pressure, vacuum, cryogenic fluid applications)? Yes

Pressure Hazards	
Source Name	Description
Ultra high vacuum systems	(no location data)

Questions

Answers

- 10a Do personnel function as pressure system operators? Yes
- 10b Do personnel function as a pressure installers? Yes
- 10c Do personnel handle cryogenic fluids, or design, install, or operate cryogenic fluid-handling systems? Yes
- 10d Does an up-to-date data package or Pressure Safety Analysis Report, reflecting current personnel and system configuration, exist for all systems? Yes
- 10e Do supplier-established pressure ratings exist for all systems and system components? Yes
- 10f Are pressure system (or component) reevaluations being performed according to the requirements of the Pressure Safety Manual? (A common example would be the replacement or retesting of pressure relief valves.) Yes
- 11 **Noise:** At any time, do activities produce potentially high noise levels? No
- Noise that would require you to raise your voice to be heard by another person three feet away (greater than 85 decibels) (potential sources include: compressors, shredders, heavy machinery, saws, grinders, pumps, etc.)
 - High impulse/impact noise (potential sources include: explosions, gunshots, jackhammers, pressure releases, etc.)
 - Ultrasound noise (potential sources include: ultrasonic welders, ultrasonic cleaners, and turbo-pumps, fluid flow, etc.)

	Questions	Answers
12	Miscellaneous Hazards: Does the facility or activity involve any of the following hazards or activities? <ul style="list-style-type: none"> - Ergonomic or musculoskeletal stressors - Construction-like activities - Work around asbestos - Ladders - Elevated surfaces (other than ladders) - Commercial underwater diving - animals and hazardous Plants - Aircraft - Airborne objects (other than aircraft) - Firearms - Use of human subjects - Use of Sealed Drums 	No
13	Outside of Manufacturer's Recommendations: Does this work involve the use of equipment, tools, or materials outside of their design specifications or outside of the manufacturer's recommendations? (See Help Text for examples). Please enter each item into the hazard table.	No
14	Non-Commercial Hazards: Does this work involve the use of noncommercial equipment or apparatus (excluding robots, robotics systems, and equipment where the only hazard is a pressure system that has a pressure safety data package)? Please enter each noncommercial piece of equipment into the hazard table.	No
15	Environmental Concerns: Are there any potential environmental concerns with this activity that align with the SNL Environmental Management System (EMS) aspects, such as chemical use, fuel or oil storage, waste generation (except sanitary trash), construction activities, disturbance to habitat or protected species, or discharges to the air, ground surface, ground water, or the sewer systems?	Yes

Notes: This facility will generate less than 100 kg/month of hazardous waste.

Environmental Concerns Hazards		
Source Name	Type	Est. Quantity
Evaporated organic solvents	air	100 l/yr
	Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A	
Hazardous Waste	liquid and solid	<100 kg/mo
	Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A Comments: The labs will generate small quantities of hazardous waste including organic solvents, acids, and bases.	
Sterilized biological wastes	solid	5 kg/mo
	Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A Comments: All biological wastes will be sterilized prior to disposal.	
Water from acid neutralizer	Water	100 gal/day
	Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A Comments: There will be water discharged to the sanitary sewer from the acid neutralizer system.	

	Questions	Answers
15a	Wastewater: Are there any wastewater discharges in this activity?	Yes
15a(1)	General Discharges: Are the wastewater discharges of a general nature, such as the washing and rinsing of laboratory glassware and/or process components?	Yes
15a(2)	Categorical Processes: Are the wastewater discharges from a categorical process or does the activity contain a zero discharge categorical process?	No
15a(3)	Will this activity use more than 1,000 gallons of water per day?	No
15b	Air: Are there any air discharges or emissions at this activity?	Yes
15b(1)	Ozone Depleting Substance (ODS): Are there any ODSs at this activity?	No
15b(2)	Will this activity include the installation and or use of combustion equipment ? Combustion equipment includes boilers and internal combustion engines, such as generators.	No
15b(3)	Will this activity include the use of chemicals that could be Clean Air Act Regulated?	Yes
15b(4)	Will this activity involve open-burn activities?	No
15b(5)	Will this activity involve soil disturbance, building demolition, or construction that disturbs soil , including access roads and staging areas?	No
15b(6)	Radionuclide NESHAP: Are there any radionuclide air discharges or use of radionuclides in gaseous form or at elevated temperatures at this activity?	No
15c	Radioactive Waste: Will this activity generate any radioactive waste, or will Members of the Workforce be required to handle radioactive waste?	No
15d	Hazardous Waste: Will this activity generate any hazardous waste, or will Members of the Workforce be required to handle hazardous waste?	Yes
15d(1)	Less-Than-90-Day Accumulation Area: Will this activity store any hazardous waste in a less-than-90-day accumulation area ?	No
15d(2)	Acutely Hazardous Waste: Will this activity generate any acutely hazardous waste ?	No
15d(3)	Waste Containing Mercury: Will this activity generate any waste containing mercury (e.g., switches, thermometers, manometers, elemental mercury (Hg), or mercury compounds [e.g., mercuric oxide (HgO)], etc.)?	No
15e	Mixed Waste: Will this activity generate any mixed waste , or will Members of the Workforce be required to manage mixed waste?	No
15f	Infectious / Biohazardous Waste: Will this activity generate any infectious or biohazardous waste, or will Members of the Workforce be required to handle infectious or biohazardous waste?	No
15g	Radioactive Contamination: Will this activity be conducted in an area for which a reasonable potential exists for introducing radioactive contamination or causing activation of material that may become waste?	No
15h	Material or Waste of Unknown Origin: Will this activity require handling material or waste of unknown origin?	No
15i	Fuels and Oil Storage: Does this activity use a fuel or oil storage container capable of containing 55 gallons or more?	No
15j	Discharges to Ground Surface: Does this activity have a potential for any discharges to the ground surface ?	No
15k	Improvements/modifications to structure/building exteriors and landscaping: Will this project involve activities that require modifications to the exteriors of structures and buildings or modification to existing landscape, including removal of vegetation?	No

	Questions	Answers
15l	Disturbance to habitat or protected species: Will this project involve activities that will disturb habitat or protected species, including wildlife management and outdoor projects or testing activities?	No
16	Packaging and Transportation of Hazardous Materials: Will any activities covered by this PHS involve the packaging and transportation of hazardous material (including explosives or radioactive material)?	No
17	Fire Protection Concerns: Will the activity include any of the following? <ul style="list-style-type: none"> - Members of the Workforce modifying in any way any fire suppression or life safety system (fire rated walls, fire doors, fire sprinklers, fire alarm devices, fire extinguishers, or means of egress)? - Members of the Workforce performing hot work in association with this facility or project activity? 	No
18	Biological Materials: <i>(see Help text before answering this question.)</i> Do activities involve the use of or potential exposure to biological materials?	No
19	Confined Spaces: Are confined spaces present in the work area?	No
20	Beryllium: Do operations include any activities that? <i>(Review the Help text before answering this question)</i> <ul style="list-style-type: none"> - Use or handle beryllium, beryllium-containing alloys or beryllium oxides? - Create or work with beryllium ceramics? - Handle waste potentially-contaminated with beryllium or waste containing beryllium? - Perform decontamination of beryllium contamination? - Entail work in a beryllium contaminated building or area? - Apply abrasive or destructive methods to metal objects, articles, weapon components or bar stock, potentially containing beryllium? - Use non sparking tools containing beryllium? 	No
21	Other Hazards: Are there any: <ul style="list-style-type: none"> - Hazards that have not been adequately addressed in other questions. (e.g., polar bears, foreign travel, specific chemical hazards, natural hazards [e.g., wind, excessive water, radon, or overhead trees]), or - Hazards of unknown magnitude (e.g., emergency response, hazards encountered by roving personnel) Enter all of these hazards in the User- Specified Hazards table. Enter "Low" as the Hazard Classification for hazards of unknown magnitude, unless the Safety Basis Department has determined otherwise.	No

Controls Worksheet:

	Questions	Answers
C1	Local Exhaust Ventilation: Do the activities covered by this PHS use local exhaust ventilation (LEV) (e.g., laboratory hoods, glove boxes, downdraft tables, "elephant trunks," canopy hoods, paint booths, slot ventilation, portable welding ventilation, etc.)?	Yes
C2	Personal Protective Equipment: Are hazards (e.g., chemicals radiological, electrical, mechanical, thermal, flying particles and/or falling or rolling objects) encountered that are capable of causing injury or impairment in the function of any part of the body through absorption, inhalation, or physical contact?	Yes
C2a	Has a workplace hazard assessment been performed for the activities covered by this PHS?	Yes
C2a(1)	Did the workplace hazard assessment determine that personal protective equipment will be required?	Yes
C2a(1)a	Has the workplace hazard assessment determined respiratory protection is required?	No
C2a(2)	Does the workplace hazard assessment allow voluntary use of respiratory protection?	No
C3	Control of Hazardous Energy (LOTO): Do you have any equipment in your operations that requires any of the following activities? <ul style="list-style-type: none"> - Construction - Installation - Setup - Adjustment - Inspection - Modification - Maintenance - Service - Lubrication - Cleaning - Unjamming - Making adjustments or tool changes 	Yes
C3a	While performing the servicing and maintenance activities identified above, is there potential for injury from the unexpected energization or startup of the machines, equipment, or process from a release of stored energy?	Yes
Notes: Individuals performing these tasks have completed the appropriate training for Lockout/Tagout.		
C3a(1)	Will service or maintenance be done on a machine, equipment, or a process by the Members of the Workforce within your organization ?	Yes
C3a(1)a	Will all service or maintenance be done on a machine, equipment, or a process by the Members of the Workforce within your organization ?	No
C3a(1)b	During the service and maintenance can all the equipment be controlled by cord and plug ?	No
C3b	Are there any activities where control of hazardous energy sources is only necessary for protection of configuration, equipment, or property (i.e., not for personnel protection)?	No
C4	NEPA Compliance: Has this project or activity been reviewed for National Environmental Policy Act (NEPA) compliance?	Yes
C4a	Are all relevant NEPA documents listed in the Documents section of this PHS?	Yes

IX. Hazard Analysis (HA) Section

Hazard Analysis

Source Name or Question: Question 5k(1)
Source Reason: Toxic gasses
Hazardous Condition: Inhalation / Potential for environmental release

PHS Identified 'Low' Hazard.

Author's Comment: The gases of concern are Ammonia (1 lb), Chlorine (1 lb), Boron Trichloride (1 lb) and Silane (8 lbs). All are contained within gas cabinets are are designed to shut down upon detection of any leaks.

Cause: System/Component/Equipment Failure

The valve on the cylinder fails causing a leak.

Consequence: Major Illness/Injury

Personnel exposure to gases.

Mitigation: Active Engineering Control-Other

The system is designed to shut off the gas if it were detected within the gas cabinet.

Mitigation: Procedural/TWD (SOP/OP/RWP)-Other

Doc Id: OP1100.189 **Title:** Operating Procedure for Toxic/Pyrophoric/Inert Gas Cylinders Change-Out

Mitigation: Warning Device-Audible Alarm (horn/bell/whistle)

A high level alarm will activate upon the detection of a leak at 3 times the Threshold Limit Value. This notification alerts personnel to evacuate the building.

Mitigation: Training-Other

Personnel have site specific training for integration lab activities and are aware of the hazards and what to do in case of an emergency.

Mitigation: Training-Other

Author Assessment: Applied Mitigation and Prevention are sufficient.

The design of the cabinet to shut off the gas when detected from a leak, the procedure and training received are adequate controls for this hazard.

Source Name or Question: Question 8a
Source Reason: Unevaluated nonionizing radiation
Hazardous Condition: Potential exposure to nonionizing radiation.

PHS Identified 'Low' Hazard.

Author's Comment: UV contact mask aligner
Active Engineering Control-Electrical/Mechanical Access
Control System
Equipment is designed to prevent this type of injury.
Author Assessment: Applied Mitigation and Prevention are sufficient.
IH assessment of this equipment has been requested as required. However, the equipment is designed to be safe when operated according to manufacturers specifications. Individuals are trained appropriately.

Cause: Other

Equipment is damaged during use.

Consequence: Minor Illness/Injury

Personnel could potentially be exposed to UV.

Mitigation: Active Engineering Control-Electrical/Mechanical Access
Control System

Equipment is designed to prevent this type of injury.

Mitigation: Training-Other

Personnel are trained in the use of this equipment.

Author Assessment: Applied Mitigation and Prevention are sufficient.

The engineering control and training are deemed adequate for the use of the UV mask aligner.

Source Name or Question: Question 5a
Source Reason: Unevaluated chemical use
Hazardous Condition: potential chemical overexposure

PHS Identified 'Low' Hazard.

Author's Comment:

Cause: Human Error

Personnel do not use chemicals in designated space (i.e. wet bench/fume hood)

Consequence: Major Illness/Injury

Personnel could become exposed to chemicals being used if not in a well ventilated proper LEV system.

Mitigation:	Active Engineering Control-Air Flow Control System It is a requirement for personnel to use chemicals in a wet bench or fume hood during use.
Mitigation:	Procedural/TWD (SOP/OP/RWP)-Other Doc Id: SOP1100.001 Issue D Title: Standard Operating Procedure for Working with Hazardous and Particularly Hazardous Chemicals in Center 1100 Laboratories The SOP provides information on the use of chemicals including the hazards and controls.
Mitigation:	Training-Other Course Id: LAB100 Title: LABORATORY STANDARD INFORMATION AND TRAINING All personnel with access to the clean room are required to complete this course.
Mitigation:	Training-Other Course Id: LAB103 Title: SITE-SPECIFIC LABORATORY SAFETY TRAINING All personnel with access to the clean room are required to complete this course.
Mitigation:	ILUA - Integration Lab Unescorted Access training is provided to all personnel working in the clean room. This training is supplemental to the LAB100 and LAB103 providing training on specific activities. Procedural/TWD (SOP/OP/RWP)-Other An SWP has been written which also addresses the hazards and controls when working with chemicals. This will be reviewed by IH.
Author Assessment:	Applied Mitigation and Prevention are sufficient. The active engineering control, procedures and training are deemed adequate for these chemical operations.

Note: 23 hazard analysis(es) were not reported, because no (optional) hazard analysis was performed for them.

X. Supplemental Information

PHS Input

Notes from Interview Questions

(Q 1h) - All the RGDs utilized in the integration laboratory are classified as inherently safe.
 (Q 6d(1)) - If is discovered as being non-NRTL equipment, the electrical equipment or appliances will be approved and documented using the Sandia Non-NRTL evaluation process.
 (Q 15) - This facility will generate less than 100 kg/month of hazardous waste.

Notes from Controls Questions

(Q C3a) - Individuals performing these tasks have completed the appropriate training for Lockout/Tagout.

User Entered Hazard Tables

Environmental Concerns Hazards		
Source Name	Type	Est. Quantity
Evaporated organic solvents	air	100 l/yr
	Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A	
Hazardous Waste	liquid and solid	<100 kg/mo
	Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A Comments: The labs will generate small quantities of hazardous waste including organic solvents, acids, and bases.	
Sterilized biological wastes	solid	5 kg/mo
	Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A Comments: All biological wastes will be sterilized prior to disposal.	
Water from acid neutralizer	Water	100 gal/day
	Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A Comments: There will be water discharged to the sanitary sewer from the acid neutralizer system.	

Pressure Hazards	
Source Name	Description
Ultra high vacuum systems	
	(no location data)

Thermal Hazards	
Source Name	Temperature
Heating equipment	500 F
	Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A Comments: Heating equipment such as soldering irons, heat guns, etc. will be used.
Liquid Nitrogen and Argon	77 K
	Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A
ovens	1000 C
	Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A Comments: Laboratory ovens and furnaces will be used.

PHS Output - Results and Conclusions

Major Safety Concerns

The hazard classification is: **Low**

The required documentation is: **PHS with integral HA**

The hazard classification is: Low since this Facility or Lab involves:

(QUESTION 5a) potential chemical overexposure

(QUESTION 5k(1)) Potential exposure to toxic gasses in the event of a release

(QUESTION 8a) Potential exposure to nonionizing radiation.

Other Safety Concerns (potential hazard sources) for this Facility or Lab

(Required by general corporate business process) traffic related hazards for injury

(Required by general corporate business process) common electrical hazards

(QUESTION 1) potential for minor injury or illness

(QUESTION 1b(1)) potential for minor injury or illness

(QUESTION 4) Potential eye and skin hazards

(QUESTION 5) Potential personnel exposure to chemicals & fire protection regulatory requirements

(QUESTION 5c) Unbound Engineered Nanoscale Particles(UNP); Potential inhalation and dermal exposure to UNP.

(QUESTION 5e) Corrosive chemical; Potential exposure to skin and eyes.

(QUESTION 5f) Potential exposure to skin and eyes

(QUESTION 5h) fire/explosion hazard

(QUESTION 5i) hazards from fires, reactions, and explosions

(QUESTION 6a) potential electrical shock or arc

(QUESTION 7) potential injury from mechanical forces

(QUESTION 7b) potential injury from portable power tools

(QUESTION 9a) Contact with hot or cold objects

(QUESTION 10) Injury or damage

(QUESTION 15) potential for regulatory action

(QUESTION 15a) potential to exceed permitted amounts

(QUESTION 15a(1)) potential to exceed permitted amounts

(QUESTION 15b) potential to emit regulated contaminants
(QUESTION 15b(3)) potential to emit regulated contaminants
(QUESTION 15d) potential for regulatory action
(QUESTION C3) potential injury to personnel from exposure to hazardous energy

Required Training

[Note: This training is a regulatory requirement for one or more people involved in operations associated with identified hazards. Each class may not be required by all people working in the area.] Please note that some training classes are only provided occasionally. Please be sure to allow adequate lead-time for personnel to schedule and complete training.]

NONE

Results Based On Answers

The results in this PHS were based on the following answers to interview questions:

Q 0 answered: Y; Q 1 answered: Y; Q 1a answered: Y; Q 1b(1) answered: Y; Q 4 answered: Y; Q 4a answered: Y; Q 5 answered: Y; Q 5a answered: N; Q 5c answered: Y; Q 5e answered: Y; Q 5f answered: Y; Q 5g answered: Y; Q 5h answered: Y; Q 5i answered: Y; Q 5k(1) answered: N; Q 6a answered: Y; Q 6a(2) answered: N; Q 7 answered: Y; Q 7a answered: N; Q 7b answered: Y; Q 8 answered: Y; Q 8a answered: N; Q 9a answered: Y; Q 10 answered: Y; Q 10a answered: Y; Q 10b answered: Y; Q 10c answered: Y; Q 10d answered: Y; Q 10e answered: Y; Q 10f answered: Y; Q 15 answered: Y; Q 15a answered: Y; Q 15a(1) answered: Y; Q 15b answered: Y; Q 15b(3) answered: Y; Q 15d answered: Y;

Interquestion Dependency Concerns for this Facility or Lab document:

(none)

XI. EOC Concerns

Chemical; Energized Electrical; Energized Laser; Energized Mechanical; Energized Systems - RGD;
Environmental Concerns; Other Hazard; Non-ionizing Radiation; Pressure